If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

14.6 C-A EMS Process Assessment for Electronic Assembly Operations (AGS-010-EAO)

Text Pages 2 through 7

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Chairman Date

D. Passarello

14.6 C-A EMS Process Assessment for Electronic Assembly Operations

BROOKHAVEN NATIONAL LABORATORY
PROCESS ASSESSMENT FORM

I. General Information

Process ID:	AGS-010-EAO	PEP ID# 010		
Process Name:	Electronic Assembly Operations			
Process Flow Diagrams:	AGS-010-EAO-01 and -02			
Process Description:	The process includes the Electronic Assembly Operations conducted in Buildings 911A, 911C, 919B, 923 and 1007W, associated with the fabrication and operation of Collider-Accelerator support systems. Electronic assembly refers to the installation and interconnection of wires, mechanical connectors and electronic components onto printed circuit boards and within a piece of equipment utilizing solder. Applicable Subject Areas include: Hazardous Waste Management, Radioactive Waste Management, Liquid Effluents and Pollution Prevention.			
Dept./Div.:	Collider-Accelerator Department			
Dept. Code:	AD			
Building(s):	911A, 911C, 919B, 923 and 1007W			
Room(s):	911 Room 142, and Room A-311		919B	911 Room 143, 1007W
Point of Contact:	A. Curcio, W. Venegas	A. Curcio, R. Atkins, A. Casper	A. Ravenhall	R. Zapasek
Originally Prepared by:	G. Schroeder	Original Reviewers:	G. Goode M. VanEssendelft	
Initial Release Date:	01/18/99			

II. Detailed Process Descriptions and Waste Determination

Presently, the C-A Department has a major nuclear physics program, the focus of which is the Relativistic Heavy Ion Collider (RHIC) that operates to study nuclear phenomena in heavy ion collisions. The RHIC has four major RHIC experimental areas where ion beams collide: PHENIX, PHOBOS, STAR and BRAHMS. However, the RHIC facilities are, in fact, the terminus of a complex of other accelerators and beam transfer equipment that also have experimental programs.

Located in the north central portion of BNL, the Collider-Accelerator Department is composed of seven accelerator physics machines including two Tandem Van de Graaffs (TVDGs), Linac, Booster, Alternating Gradient Synchrotron (AGS) and 2 rings in the Relativistic Heavy Ion Collider (RHIC). The TVDGs, Linac and Booster are considered pre-accelerators although they each have fixed target experimental programs. The TVDG and Linac supply low to medium energy particles to the Booster, which in turn accelerates and directs beam to AGS. The AGS is the heart of the high-energy system and it is utilized to produce or accelerate high-energy protons, polarized protons and heavy ions for use in various high-energy high-intensity experiments developed to study the fundamental characteristics of matter.

The TVDG has two experimental halls for applied nuclear physics research. The Linac supplies beam to fixed targets in the BLIP, which produces medical radioisotopes. The Booster supplies beam to fixed targets in the Booster Applications Facility, an experimental area that is used for space-radiation research. Two major experimental areas extend off the AGS: the slow extracted-beam (SEB) experimental area, and the fast-extracted-beam (FEB) experimental area, which are used for high-energy physics and proton radiography research.

This process assessment reviews Electronic Assembly Operations associated with equipment maintenance and construction within C-AD.

Electronic assembly refers to the installation and interconnection of wires, mechanical connectors and electronic components onto printed circuit boards and detector subassemblies within a piece of equipment utilizing solder and/or conductive epoxy. Electronic assembly operations are currently conducted in Buildings 911A/C, 919B, 923 and 1007W. There are several rooms in Building 911 where electronic assembly work is conducted.

Chemical usage and waste generation is similar at all electrical shops. In general, chemicals such as isopropyl alcohol, and acetone, are used to clean the electronic parts during assembly operations. Electronic parts are connected mechanically or soldered using lead/tin solder.

Chemicals utilized in Buildings 911, 919B, 923, and 1007W are tracked using the BNL Chemical Management System (CMS), and can be found at **Chemical Management System**. Not all of the chemicals listed in the CMS list or located in Buildings 911, 919B, 923, and 1007W are used on a regular basis. When projects are completed, the chemicals used for that particular project typically remain in storage cabinets at the building for possible use in the future.

In general, waste generated in Buildings 911A/C, 919B, 923, and 1007W during electronic assembly operations is reused when possible, recycled if possible, discarded to hazardous waste or to the regular trash as allowed by C-A or SBMS procedures.

Regulatory Determination of Process Outputs

1.0 Electronic Assembly Operations

Electronic parts are connected to circuit boards mechanically or soldered using lead/tin solder. Water-soluble solder flux is applied from plastic bottles. Circuit surfaces are cleaned using isopropanol, isopropyl alcohol, Aerosolve Safety Solvent, or LPS Contact Cleaver. These cleaners are highly volatile and quickly evaporate from the working surfaces without need for cloth wiping, which can leave fiber residue behind. Volatile vapors are released to the immediate work area (1.1). Aerosolve is dispensed in aerosol cans. When empty, the cans are disposed of to a container for recycling by Plant Engineering (1.2). All shops collect tin/lead solder tailings in containers. The full containers go to Central Shops for recycling. (1.3)

Assembly operations also generate both scrap wire and scrap metal streams. Scrap wire is reused (depending on the length) or discarded in the regular trash (1.4). Wire is segregated along with discarded metal parts into a special metals collection bin located on the northwest corner of Building 911. The metal collected in this bin is recycled (1.5). Unwanted circuit boards that have any hazardous components (e.g. batteries, mercury switches, silver) have those components removed and the boards are placed in the recycling bin for electrical components (1.7). The removed components (or the whole board if removal is not feasible) go to Hazardous Waste management for disposal.

In Building 919B compressed argon and CO_2 gas cylinders are used. These gases are used to test segmented wire ionization chambers (SWICs, these are charged wire grid devices used to indicate the precise location of the beam). In Building 911, Room 143, compressed argon and CO_2 gas cylinders are used by the Radiological Control Division Technicians for counting equipment analysis. Gas is flowed through the units and allowed to escape into the airspace of the work area (1.6). Since the emission of CO_2 and inert gases are classified as "exempt" under New York State air regulations, no permits are required for the venting of these gases. When empty, the cylinders are returned to the supplier for re-use. In Room 143 of building 911A and in 1007W work is performed on power supply chassis modules and associated printed circuit boards. The operations in these two areas involves the repair and testing of power supplies. See process flow diagram AGS-010-EAO-01.

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
1.1	Evaporative VOC or gaseous emissions to room air	Non-hazardous fugitive emission	Released to room air	None

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
1.	Empty aerosol containers	Non-hazardous solid waste as determined by process knowledge.	Recycled to Plant Engineering	None
1.3	Solder tailings	Hazardous if it contains lead / process knowledge	All shops collect tailings in containers and full containers go to Central Shops for recycling	None
1.4	Wire scraps	Non-hazardous solid waste as determined by process knowledge	Waste is reused or discarded in the regular trash	None
1.5	Scrap metals	Non-hazardous solid waste as determined by process knowledge	Segregated for recycle	None
1.6	Empty compressed gas cylinders	Non-hazardous solid waste as determined by process knowledge	Cylinders returned to supplier for re-use	None
1.7	Used circuit boards	Potentially hazardous if could to contain lead, silver or mercury components	Hazardous components removed and sent as hazardous waste, boards go to recycling	None

2.0 Building 923

Building 923, Room 3 houses a parts washer used to remove dust and dirt from electronic components in the High Energy Equipment Pool, e.g., power supplies. All components are surveyed and verified to be radiologically clean prior to washing. Cleaning is conducted on a turntable mounted in a wash basin which has a drain connected to the site sanitary system. Dilute Zepride E is applied to the item to be washed via a compressed air siphon. Rinse water is allowed to drain to sanitary (2.1). (See process flow diagram AGS-010-EAO-02.) Each washing can generate up to two gallons of wastewater. The wastewater from this process has been previously reviewed by the Environmental Services Division for concerns regarding potential metallic leachate; it has been found to acceptable for unrestricted sanitary release.

Room 37 houses a video camera repair shop. Some of the cameras serviced in this shop have been used for surveillance in AGS target caves and other areas, which are unmanned due to radiation exposure precautions. Since the cameras have been exposed to radiation in the vicinity of the beam line, the parts may be activated. Parts are surveyed for this possibility. Radioactive components from these cameras that are not reused are segregated and discarded as low-level radioactive waste (2.2).

Building 923 also houses an instrument calibration and repair room known as "The Pit". This room contains radioactive calibration sources housed in lead shields. The aerosol anti-static spray Zep Ex-Stat and LPS Contact Cleaner is in use here. Empty aerosol cans are disposed of in container for recycling (1.2).

Waste ID	Waste Description	Determination/Basis	Waste Handling	Corrective Action Required
(2.)	Rinse water containing dilute Zepride E	Non-hazardous liquid waste / process knowledge and MSDS	Released to sanitary system	None
[2.]	Video equipment components	Potentially radioactive / as indicated by radiological survey	Disposed of as low-level radioactive waste	None

III. Waste Minimization, Opportunity for Pollution Prevention

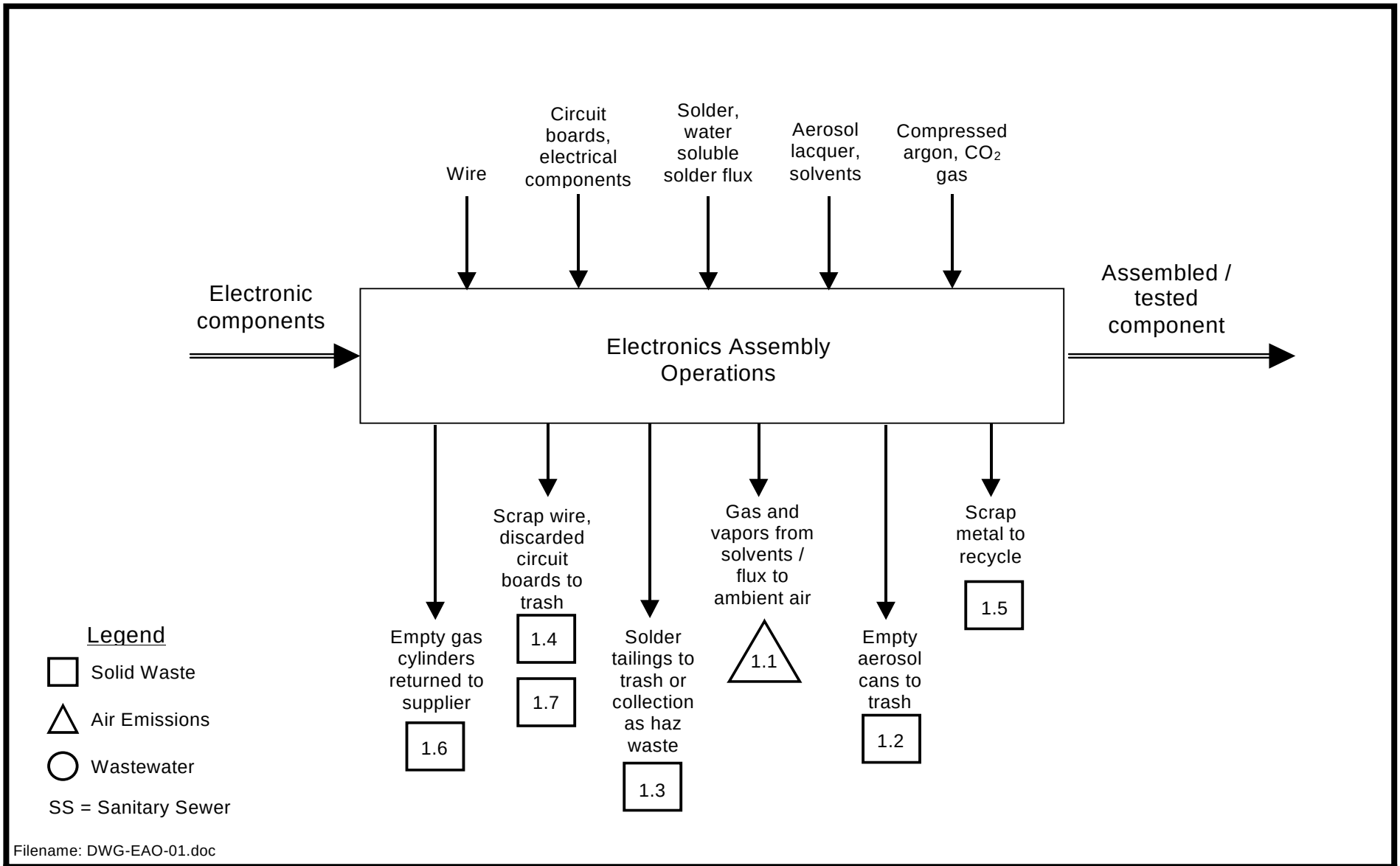
During the initial effort of baselining the Collider-Accelerator Department processes for Pollution Prevention and Waste Minimization Opportunities each waste, effluent, and emission was evaluated to determine if there were opportunities to reduce either the volume or toxicity of the waste stream. Consideration was given to substitute raw materials with less toxic or less

hazardous materials, process changes, reuse or recycling of materials and/or wastes, and other initiatives. These actions are documented in this section of the original process evaluation. Action taken on each of the Pollution Prevention and Waste Minimization items identified can be found in the Environmental Services Division's PEP 2000 Database. Further identification of Pollution Prevention and Waste Minimization Opportunities will be made during an annual assessment of C-A processes. If any Pollution Prevention and Waste Minimization Opportunities are identified they will be forwarded to the Environmental Services Division for tracking through the PEP Database.

IV. Assessment Prevention and Control

During the initial effort of baselining the Collider-Accelerator Department Assessment, Prevention, and Control (APC) Measures operations, experiments, and waste that have the potential for equipment malfunction, deterioration, or operator error, and discharges or emissions that may cause or lead to releases of hazardous waste or pollutants to the environment or that potentially pose a threat to human health or the environment were described. A thorough assessment of these operations was made to determine: if engineering controls were needed to control hazards; where documented standard operating procedures needed to be developed; where routine, objective, self-inspections by department supervision and trained staff needed to be conducted and documented; and where any other vulnerability needed to be further evaluated. These actions are documented in this section of the original process evaluation. Action taken on each of the Assessment, Prevention and Control Measures can be found in the Environmental Services Division's PEP 2000 Database. Further identification of Assessment, Prevention and Control Measures will be made during an annual assessment of C-A processes. If any Assessment, Prevention and Control Measures are identified they will be forwarded to the Environmental Services Division for tracking through the PEP Database.

PROCESS ASSESSMENT DRAWINGS



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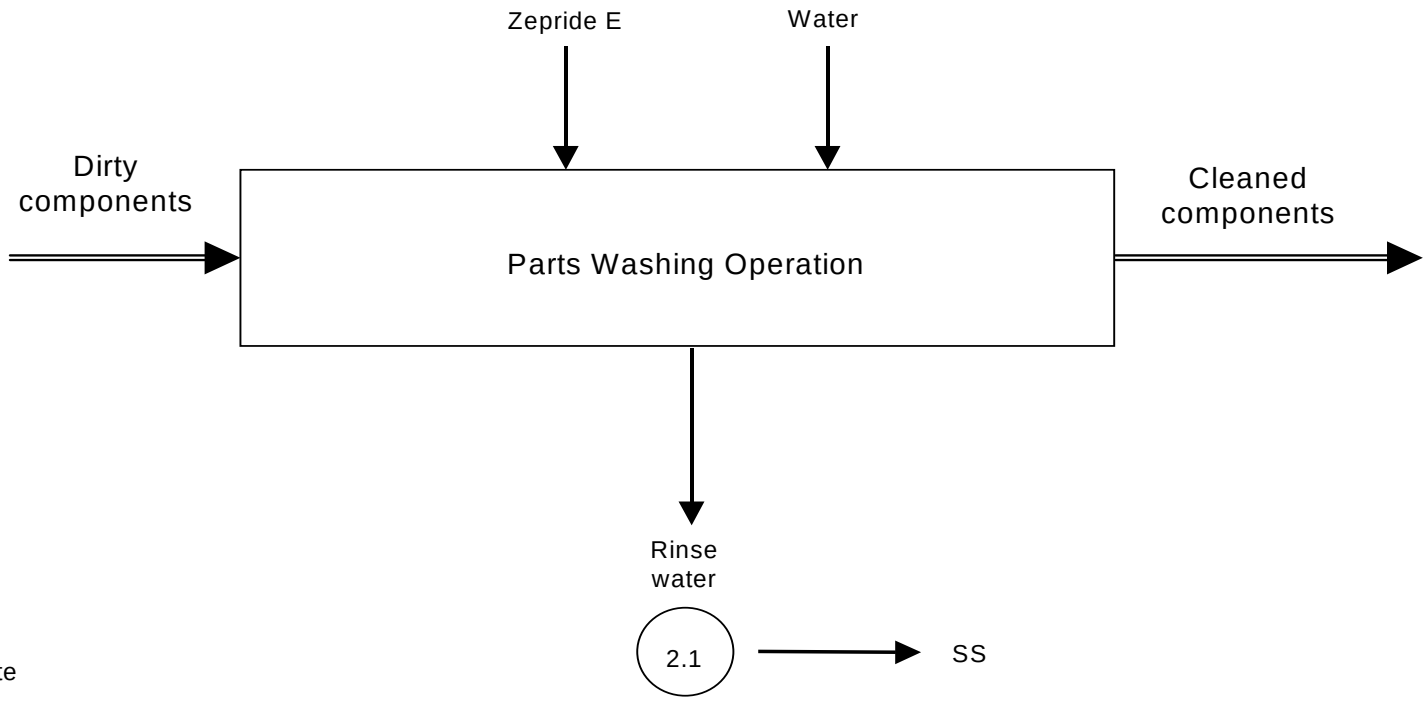
PROCESS ASSESSMENT PROGRAM

Electronic Assembly Process Flow Diagram

AGS-010-EAO-01



Legend

- Solid Waste
- Air Emissions
- Wastewater

SS = Sanitary Sewer

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PROCESS ASSESSMENT PROGRAM

Building 923 Parts Washer Process Flow Diagram

AGS-010-EAO-02